

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year)  
03 February 2000 (03.02.00)

International application No.  
PCT/US99/10863

Applicant's or agent's file reference  
54575PCT1A

International filing date (day/month/year)  
17 May 1999 (17.05.99)

Priority date (day/month/year)  
18 May 1998 (18.05.98)

## Applicant

SAITOU, Kenichi et al

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
15 December 1999 (15.12.99)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO  
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1211 Geneva 20, Switzerland

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87 87  
APR 1999  
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having a refractive index different from that of the first polymer, and does not include an electrically conductive metal.

The external reflecting device or the light sources provided with a built-in reflecting device of the prior art described above, however, have such problems as described below.

5 That is, the light source provided with a built-in reflecting device has reflective layers disposed therein, and therefore does not allow it to easily change the directivity of radiation and the range of illumination in accordance to the operating conditions. In the case of the external reflecting device, on the other hand, it is relatively easy to change the directivity of radiation in accordance to the operating conditions, although the reflecting  
10 device is bulky and therefore it is difficult to use the reflecting device at a place where sufficient space cannot be secured while meeting the operating conditions. Also the directivity of radiation is uniquely determined by the design of the reflecting device, and therefore cannot be changed after installation.

15 Although it is known to use the dielectric reflective film as described above as a material to constitute the reflective surface of an external reflecting device (such as a reflector disposed at a predetermined distance from a light source, namely being separated by a body of air), no means has been suggested for easily changing the directivity of radiation in accordance to the operating conditions and for effectively improving the intensity of light radiated by the light-emitting apparatus.

20 Accordingly, the present invention provides a light reflective film capable of easily controlling the directivity of radiated light and the range of illumination in accordance to the operating conditions, and also capable of effectively increasing the intensity of the light emitted by the light-emitting apparatus, even in a place where sufficient space for the installation of the external reflecting device cannot be secured.

### SUMMARY OF THE INVENTION

25 The present invention further provides a light-emitting apparatus capable of effectively increasing the intensity of radiated light by using the light reflective film described above.

30 In one aspect, the present invention provides a light reflective film intimately contacted with a light emitting surface of a light source in such a manner that a part of said light-emitting surface is covered with said film, thereby the intensity of the light emitted

from the remaining and uncovered part of the light emitting surface is increased, characterized in that the light reflective film further comprises a dielectric reflective film having a reflective surface opposed to the light-emitting surface of the light source and a light-transmittive adhesive film intimately contacted with the reflective surface of the dielectric refractive film.

In another aspect, the present invention provides a light-emitting apparatus characterized by being provided with:

(a) a light source, and

(b) a light reflective film intimately contacted, through a light-transmittive adhesive film, with a light-emitting surface of said light source in such a manner that a part of said light-emitting surface is covered with said light reflective film; and

showing an increased intensity of the light emitted from the remaining part of the light-emitting surface of said light source, said part being uncovered with said light reflective film.

Subsequently, preferred embodiments of the present invention will be described in detail.

### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross sectional view showing one preferred embodiment of the light-emitting apparatus according to the present invention;

Fig. 2 is a cross sectional view showing one preferred configuration of the light reflective film according to the present invention;

Fig. 3 is a cross sectional view showing another preferred configuration of the light reflective film according to the present invention; and

Fig. 4 is a graph showing the results of evaluating directivity of radiation from the light-emitting apparatus according to the present invention, with the angle of rotation being plotted along abscissa and the luminance being plotted along ordinate.

### DETAILED DESCRIPTION

First, an operation of the present invention will be described to assist in better understanding of the present invention.

WHAT IS CLAIMED IS:

1. A light reflective film intimately contacted with a light-emitting surface of a light source in such a manner that a part of said light-emitting surface is covered with  
5 said film, thereby the intensity of the light emitted from the remaining and uncovered part of the light-emitting surface is increased, characterized in that the light reflective film further comprises a dielectric reflective film having a reflective surface opposed to the light-emitting surface of the light source and a light-transmittive adhesive film intimately contacted with the reflective surface of the dielectric refractive film.

10 2. A light-emitting apparatus characterized by being provided with:  
(a) a light source, and  
(b) a light reflective film of claim 1 intimately  
contacted, through a light-transmittive adhesive film, with a light-emitting surface of said  
15 light source in such a manner that a part of said light-emitting surface is covered with said light reflective film; and showing an increased intensity of the light emitted from the remaining part of the light-emitting surface of said light source, said part being uncovered with said light reflective film.

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REC'D 28 SEP 2000

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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference D 2432 PCT	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/10863	International filing date (day/month/year) 17/05/1999	Priority date (day/month/year) 18/05/1998
International Patent Classification (IPC) or national classification and IPC F21V7/12		
Applicant MINNESOTA MINING AND MANUFACTURING COMPANY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  15/12/1999	Date of completion of this report  26. 09. 00
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Lodato, A  Telephone No. +49 89 2399 8037  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/US99/10863

**I. Basis of the report**

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

**Description, pages:**

1,2,5-19	as originally filed		
3,4	as received on	05/09/2000	with letter of 05/09/2000

**Claims, No.:**

1,2	as received on	10/08/2000	with letter of 10/08/2000
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**Drawings, sheets:**

1/2,2/2	as originally filed
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2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/US99/10863

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**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-2
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-2
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-2
	No:	Claims	

**2. Citations and explanations**

**see separate sheet**

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1: WO 94 22160 A

D2: US-A-5 510 965

D3: EP-A-0 214 535

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (see description page 2-3):

A dielectric reflective layer which is in direct contact with the light-emitting surface of a light source for improving the intensity of the radiated light.

2. The object of the invention is to provide a light reflective film product comprising a dielectric reflective film and a light-transmittive adhesive film to be intimately contacted with a light-emitting surface of a light source in order to increase the intensity of the light emitted by that source. This object is achieved by the technical feature of independent claim 1.
3. The subject-matter of claim 1 therefore differs from the teaching of D1 in that:
- the light reflective film product further comprises a light-transmittive adhesive film facing the dielectric reflective film whereby in use the reflective surface is opposed to the light-emitting surface of the light source.
4. The aim of providing the dielectric reflective film faced with a light-transmittive adhesive film is to avoid decreasing of intensity of the light reflected on the dielectric reflective layer by providing an interface between the light emitting surface and the dielectric reflective layer with an refractive index higher than air. Document D1 does not refer to this problem neither to the corresponding claimed solution.
6. The remaining documents also do not address the problem, since in particular:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/US99/10863

- D2 relates to a unique reflector and director which is adapted for use with fluorescent light fixtures for reflecting and redirecting light emitted by fluorescent tube lights. The reflective surface may be a silver or chrome-like coating on the light protection tube or a plastic film having a reflective metallized coating of aluminium or other suitable metal.
- D3 relates to a reflector of coated plastic film being metallized on one surface thereof or having a reflective metallized coating of aluminium or other suitable material which can be wrapped closely about to the outer surface of a fluorescent tube and which can be attached by stripe of glue.
7. Therefore the technical feature that the light reflective product further comprises a light-transmittive adhesive film facing the dielectric reflective film whereby in use the reflective surface is opposed to the light-emitting surface of the light source is not disclosed or suggested in the available prior art.
8. **Claim 1** meets the requirements of the PCT with respect to novelty and inventive step (Article 33(2) and 33(3) PCT). **Claim 2** refers to an apparatus provided with the light reflective product of claim 1 and therefore also meet the requirements of Article 33(2) and 33(3) PCT.
9. The subject-matter of claims 1 to 2 has an industrial application in the field of lighting.

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>54575PCT1A</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/US 99/ 10863</b>	International filing date (day/month/year) <b>17/05/1999</b>	(Earliest) Priority Date (day/month/year) <b>18/05/1998</b>
Applicant <b>MINNESOTA MINING AND MANUFACTURING COMPANY et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

### 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1  
☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/10863

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 F21V7/12 F21V17/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F21V G03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 94 22160 A (HEFLIN EDWARD G) 29 September 1994 (1994-09-29) page 3, line 3 - line 19 figures ---	1,2
A	US 5 510 965 A (TEAKELL JOE F) 23 April 1996 (1996-04-23) column 3, line 50 - column 4, line 8 figure 4 ---	1,2
A	EP 0 214 535 A (GEN ELECTRIC) 18 March 1987 (1987-03-18) column 3, line 32 - line 44 column 4, line 28 - line 39 figures 1-3 -----	1,2

☐

Further documents are listed in the continuation of box C.

☒

Patent family members are listed in annex.

## \* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&amp;" document member of the same patent family

Date of the actual completion of the international search

17 August 1999

Date of mailing of the international search report

25/08/1999

Name and mailing address of the ISA

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Authorized officer

Clabaut, M

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/10863

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9422160	A	29-09-1994	AU 3967293 A	11-10-1994
US 5510965	A	23-04-1996	NONE	
EP 0214535	A	18-03-1987	US 4642741 A	10-02-1987
			BR 8604217 A	28-04-1987
			JP 2061761 B	21-12-1990
			JP 62080902 A	14-04-1987